



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

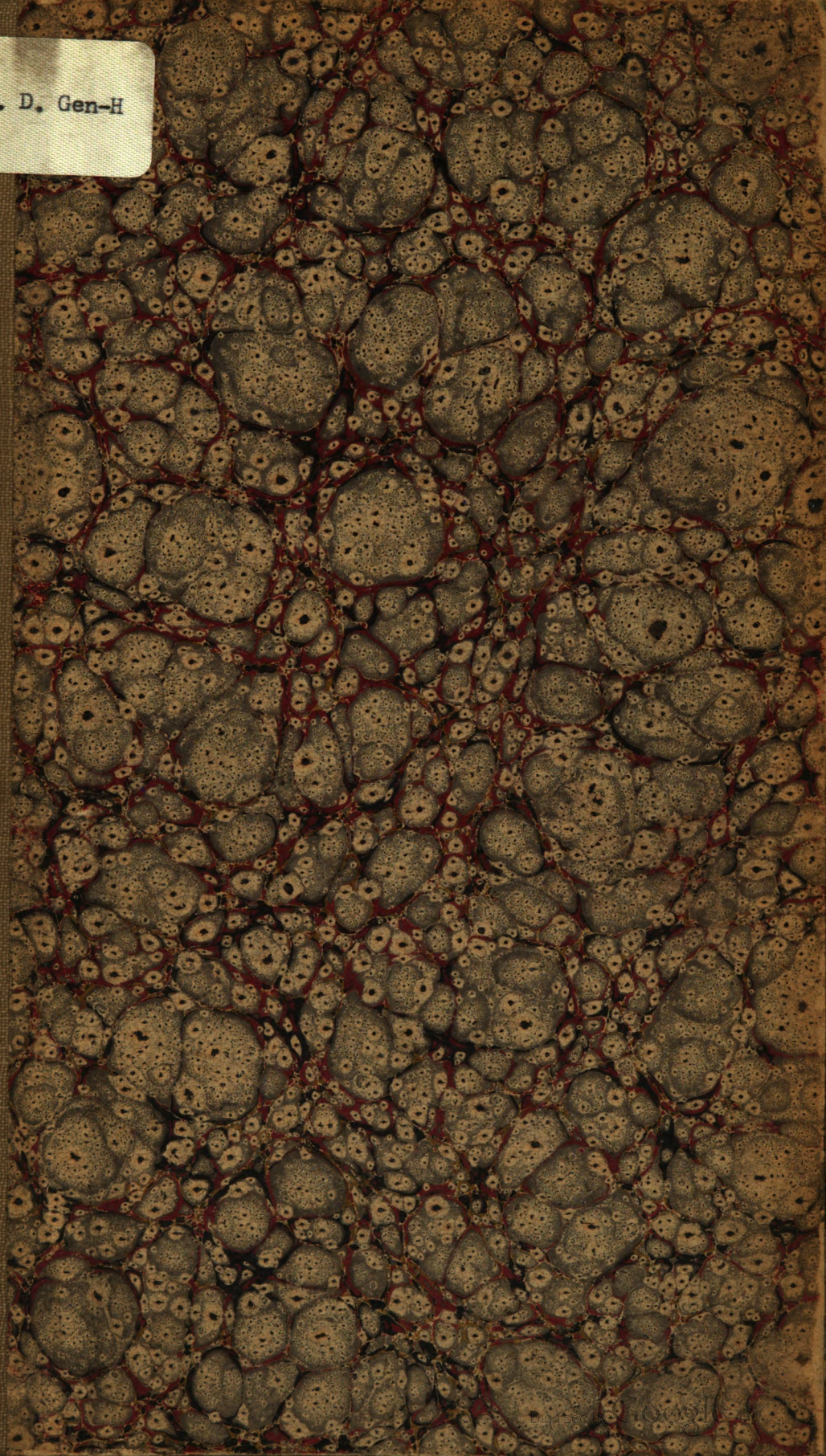
- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

Hagen, H. A. — The destruction of obnoxious insects by yeast. (1890)

E. D. Gen-H



HARVARD UNIVERSITY.



LIBRARY

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY.

21,282

H. A. Hagen Library.

June 16, 1908.

JUN 18 1903

21,282

E.D. Gen.

The Canadian Entomologist.

VOL. XII.

LONDON, ONT., MAY, 1880.

No. 5

ON THE DESTRUCTION OF OBNOXIOUS INSECTS BY YEAST.

BY DR. H. A. HAGEN, CAMBRIDGE, MASS.

The paper published CANAD. ENT., vol. xi., p. 110-14, was reprinted with some additions as a pamphlet, Cambridge, December, 1879. The recorded experiment on the Potato Bug made by Mr. James H. Burns, proved evidently the poisonous character of the yeast-fungus. The fifty beetles which were sprinkled with it died mostly on the eighth day, and the rest in the four following days. None of them survived. There were collected at the same time, October 2, and at the same place, fifty other beetles, which were kept in the same room. Of these, which were not sprinkled, to Nov. 14th only three had died, and March 1st twenty-five lived still brightly. The experiment is so far a decided success, as it has proved *that insects are killed* by the application of yeast. I may add that an experiment made a few weeks ago in a green-house seems to be successful in killing Aphides.

Dr. Metschnikoff has published a pamphlet, Odessa, 1879, and a record of it, Zool. Anzuger, 1880, Feb., concerning his experiments in destroying obnoxious insects (*Anisoplia* and *Cleonus*) by the application of fungus. The difficulty of raising the fungus chosen by him (*Isaria vixescens*) in sufficiently large quantities he hopes to overcome by raising the *Isaria* in beer-mash.

Mr. A. Giard, Lille, France (Bull. So. de Department de Nord., sec. 2, An. 2, No. 11), has published a paper containing very interesting facts regarding insect epizootics. The discovery of L. Nowakowski of the copulation of some *Entomophthora*, and the conclusive proof given by O. Brefeld that *Tarichium* is only a different form of which the *Status conidiophorus* is the *Empusa*, induce Mr. Giard to retain for the genus the name *Entomophthora*, for its asexual form the name *Tarichium*, for its sexual form the name *Empusa*. In summer, when insects in which those fungi

P

develop are abundant, the reproduction is an agamous one ; in the fall, when insects become scarce, a sexual generation appears, which produces oospores not germinating before the following spring.

Mr. Giard believes that *Tarichium megaspermum*, the parasitic fungus of the caterpillar of *Agrotis segetum*, and first described by Dr. Cohn, could be used by farmers as a very important poison to destroy those obnoxious insects—the more as O. Brefeld has proved by conclusive experiments that the caterpillar of *Pieris brassica* is very easily infested by sprinkling with water in which spores of *E. sphaerosperma* (the parasite of this species) are put in. Therefore the mummified caterpillars filled with spores should be collected in winter for use the next spring against this species. (The same has been suggested as long ago as 1874 by Dr. John L. LeConte.) The *Entomophthora* seem to attack by preference the caterpillars of the double-brooded species, which pass the winter without transforming in the chrysalis state. Mr. Giard explains thus the casual rarity of some very common species of *Chelonia*. The hypothesis of O. Brefeld that *Tarichium megaspermum* of *Agrotis* could be perhaps only a different form of *Empusa muscae* is rejected by Mr. Giard, he having discovered, as he submits, the *Tarichium* state of *Empusa muscae*, which was not known before. The opinion that both forms of a fungus develop exclusively on the same animal, similarly as other parasitic insects, can, until it is proved by doubtless evidence, hardly be accepted. We know well that the different stages of entozoa develop in very different animals, and the presumption that fungi follow a similar course is at least probable.

There are published objections against my proposition to use the yeast fungus for destruction of insects. All are based upon the same fact, that Dr. Bail's views concerning the identity of some fungi are not accepted by Botanists. As the number of students of microscopical fungi is rather limited, and as I have never studied them, I used the excellent chance to rely upon the views of my savant colleague, Prof. Farlow, which he had kindly communicated to me. Therefore I stated as a fact that "Dr. Bail's views are now not accepted by prominent Botanists," and further that "this question is without any influence regarding my proposition." I believed it to be fair to state that actually Dr. Bail has discovered the yeast fungus to be poisonous to insects, and therefore I was obliged to quote the ways and the experiments which had led him to this discovery. As Dr. Bail had not suggested the use of the yeast for the destruction of insects—

though this suggestion is the evident consequence of his discovery—and as I found it not done by anybody else, I recommended experiments to be made with the yeast fungus. The experiment with the Potato Bug has proved that yeast fungus externally brought in contact with insects, kills them. Therefore objections based on botanical grounds can not more be admitted, and the Botanists will sooner or later find the true explanation of the facts.

It has been contended that “as long as a scientific basis for the use of the yeast is not more established, a practical application of the same is simply out of question.” This assertion is a rather strange one, the more so as nothing is known about the scientific basis of Pyrethrum, of Paris green and other remedies. It has apparently been overlooked that I found in the dead beetles which had been sprinkled, in the large sinus of the wings, spores in quantity. Those spores resembled the figures given by Dr. Rees (*Unters. ueber die Alcoholgaehrungspilze* Leipzig, 1870, pl. 1, f. 15, e. d.) and were so numerous and so distinct that I could not have been deceived, the more as I am familiar with the blood fluid of insects and its corpuscles. I did not find such spores in the sinus of the wings of beetles which had not been sprinkled. There is nothing in the size and the shape of the yeast spores which could prevent them from entering an insect's body and producing disease.

Since the above was in type I have received a letter from Germany stating that sprinkling with the atomizer of diluted (compressed) yeast, a half an ounce package in three liter of water, on Aphides in greenhouses, was successful to an exceeding degree.

NOTES ON THE LARVA OF HETEROCAMPA PULVEREA, G. & R.

BY G. H. FRENCH, CARBONDALE, ILL.

Length when at rest, 1.25 inches; in shape tapering slightly from the middle forward, but more rapidly from that point backward; the body deeper than broad. General color bright clear green, a little spotted with white, marked as follows: head gray, a little lighter through the centre; joint 1 contains two dark purplish black warts on the dorsum, reddish

purple at the base, the space between them whitish. From these runs backward a bright brownish purple line, not very dark, at first about one-sixteenth of an inch wide. This expands, reaching the sub-dorsum in the posterior part of joint 4, dividing in the middle in joint 3. The lines run along the subdorsal region to the posterior part of joint 6, when they unite and cover the whole of the dorsal part of joint 7 and all but a little of the posterior part of joint 8, when it again separates and runs as two lines to the posterior part of joint 9. The space on the back of joints 3, 4, 5 and 6 between the purple lines is filled with orange. On joint 4 a spur is given off from the purple line to the third thoracic leg, another runs from joint 6 to the first pro-leg, another short spur on joint 9; both of the last with oblique lines of lighter shade. On joint 9 the orange is outside the purple, extending down the lateral spurs. Joint 10 has no purple nor orange except a little below the stigmata, but it has faint yellow subdorsal lines. Joint 11 has purple subdorsal lines which unite on the anterior part of joint 12, continuing backward as a broad dorsal line, darkest on the anal plate. The space on joint 11 between the subdorsals is filled with orange. Feet and legs purple, but the rest of the under side green; under the glass the above described brownish purple lines are not uniform, but mottled with irregular lighter lines.

The single larva from which the above description was taken, was found June 30th on the body of a white oak tree. During the few days before it pupated I fed it on the leaves of *Quercus alba* and *Q. coccinea*, both of which it ate readily. July 6th it entered the dirt of the cage to transform, and produced the imago August 6th.

NORTH AMERICAN NOCTUIDÆ IN THE ZUTRAEGE.

FIRST HUNDRED.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

Schinia gracilentia, 8, fig. 5-6.

"Georgia." I have identified this species among Belfrage's Texan collections.



3 2044 107 283 343

